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WETLANDS RESTORATION PRIMER

FOR K-12 TEACHERS

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Wetlands Restoration & Banking Program
Massachusetts Executive Office of Environmental Affairs

February 1997

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Massachusetts Executive Office of Environmental Affairs

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Unless otherwise noted, the graphics in this publication are by Thomas Ford, courtesy of Tip of The Mitt Wateshed Council, Conway, Michigan.

WETLANDS RESTORATION PRIMER

Why Should We Care About Wetlands?

Wetlands come in a variety of types that have unique characteristics and behave in specific ways. Wetlands perform "functions" within the landscape. Human society values these functions for economic, environmental, social, and political reasons. Since the 1960s, wetland laws and programs have been implemented to protect the public's interest in wetlands. Prior to that time, Massachusetts lost almost one-third of its pre-colonial wetlands. Now the state is turning to wetland restoration to bring back its wetland heritage.

Wetland functions include:

- **water quality improvement:** Wetlands cleanse our waters of pollutants.
- **storm buffering:** Wetlands protect our shorelines from storm damage.
- **flood prevention:** Wetlands store flood waters and release them gradually.
- **erosion prevention:** The roots of wetland plants stabilize river banks.
- **open space:** Wetlands serve as open space for aesthetics, education and recreation.
- **essential habitat:** Wetlands provide habitat for many species of plants and animals, including rare and endangered species.

  Wetlands are required by many types of animals and plants for survival. For many species, including the wood duck, snapping turtle, muskrat, green heron, cattail and buttonbush, wetlands are the only places they can live. For other animals, such as fish

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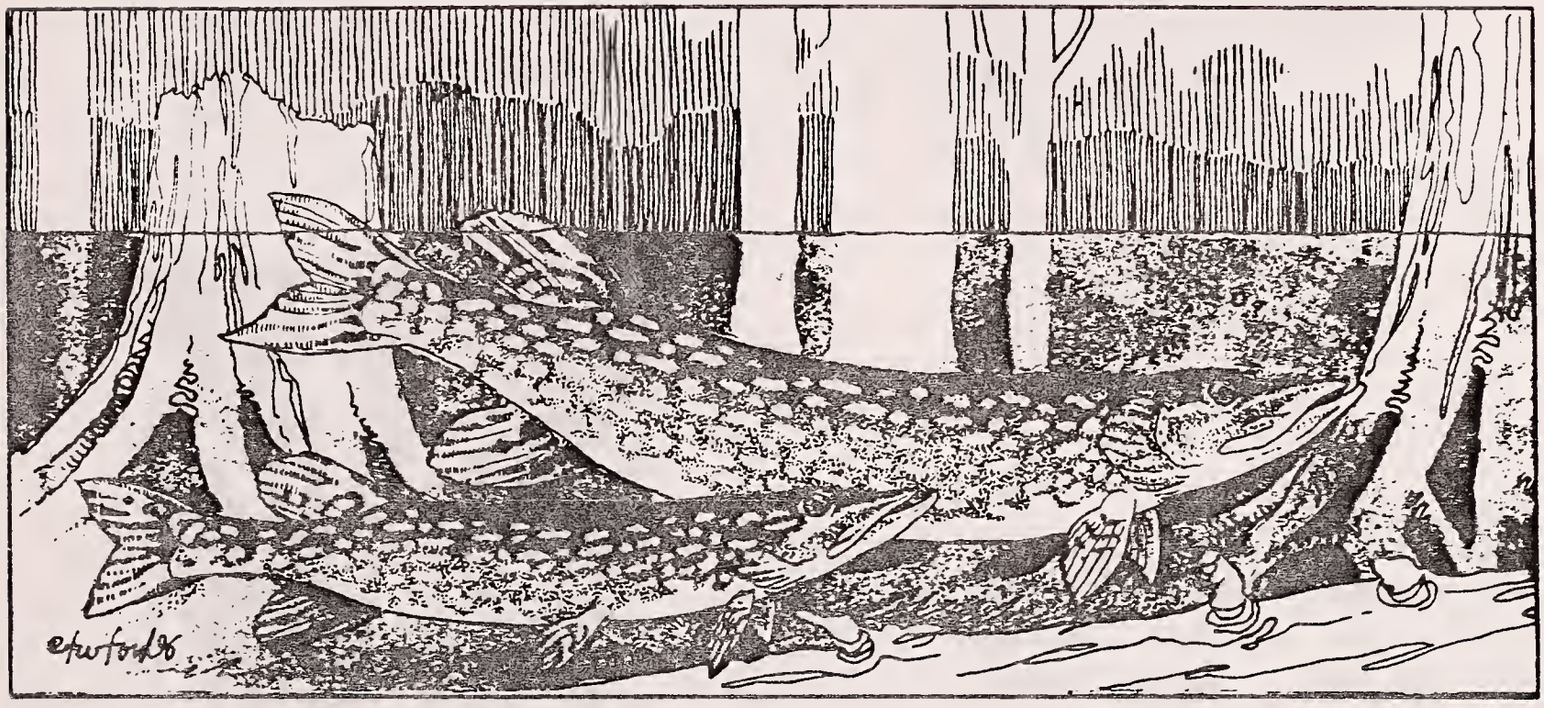
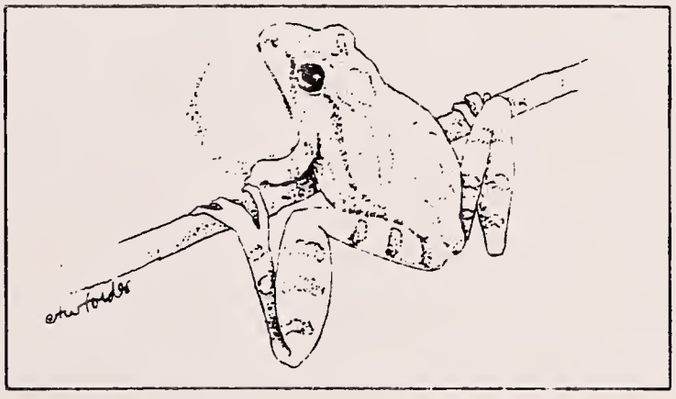
and amphibians, wetlands are critical breeding areas. Even terrestrial or upland animals frequently require wetlands for food, water, or cover.

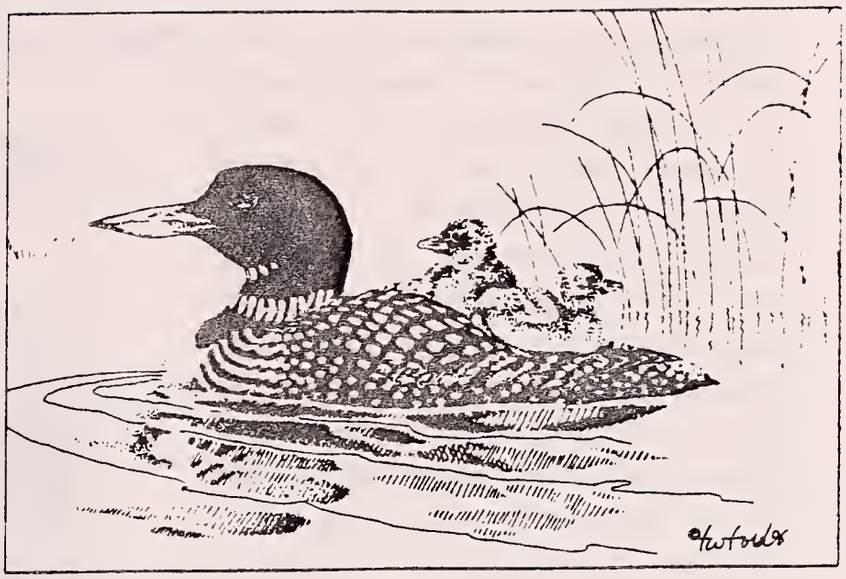
Fish: All of Massachusetts' fish depend on wetlands either directly or indirectly since wetlands are vital to maintaining water quality and regulating stream flows. Many fish feed in wetlands or upon wetland-produced food, or their young use wetlands as nursery grounds.



Amphibians and reptiles: Many amphibians, frogs, toads and salamanders, as well as snakes and turtles, use wetlands for food and cover. Vernal pools (small, seasonally flooded pond-like wetlands surrounded by forests) are the only breeding sites for frogs and many salamanders.



Birds: Massachusetts's wetlands provide year-round habitats for resident bird species, and breeding sites, wintering grounds and feeding areas for migratory birds, including waterfowl, and many songbirds such as marsh wrens, yellow warblers, and common yellowthroats.



Mammals: The more frequently observed wetland mammals are muskrats, beaver and eastern cottontail rabbits. White tail deer also use wetlands for food and cover.

In addition to the functions that occur within each wetland, wetlands contribute to the functions of watersheds. Watersheds are land areas that contribute ground or surface water to a lake, river, or estuary. Wetlands in different locations in the watershed fuction somewhat differently within the watershed system. For example, esutarine and marine wetlands store flood waters generated by coastal storms while wetlands along rivers store peak flows higher up in the watershed. Loss of many wetlands over time has had a cumulative impact on our watersheds, reducing their overall capacity to provide flood protection, cleanse our waters, and provide habitat for fish and wildlife.

Loss of wetlands costs public dollars. Where wetlands have been destroyed, their functions must be replaced, usually at great public expense, by manmade structures such as water and wastewater treatment plants, flood control dams and shoreline protection structures.

How Are Wetlands Identified?

Wetlands are lands that are flooded or that are wet at or near the ground surface for varying periods of time during the year. Wetlands are identified by wetland plants and by soils. When soils are flooded for a few days, the soils usually become oxygen-deficient (evidenced by the grey color below the surface). In soils frequently flooded for very long periods, peat or muck accumulate at the surface. Only plants with special adaptations can live in these soils.

You may know where the wetlands are located from past experience or from looking at a United States Geological Survey (U.S.G.S.) topographic map or from a municipal map. In the field, if you walk on a wetland, you wade through water, or you feel the ground is spongy underfoot; or during the dry season (usually in summer), you may find it dry on the surface and wet a foot or more below. If you are in a wetland during the dry season, look for clues that water is present at other times. Wetland plants have elevated roots. Woody vegetation will have a water line. Dead leaves on the ground have gray or black water stains. There may be a "wrack line" of dead plant material showing that water has been present.

A good way to find the wetlands in your area is to look at wetlands maps. You can order copies of detailed wetland maps from DEP's Wetlands Conservancy Program for some areas of the state. Call (617) 292-5907 to order. The U.S. Fish & Wildlife Service has produced National Wetlands Inventory maps for the entire state. These maps cover larger geographic areas. Call (413) 545-0359 to order.

What Are the Types of Wetlands?

Wetlands occur in coastal and inland areas. They are the transition zone between water and dry uplands. Wetlands may fill vast areas of river floodplains or estuaries, or they may form a narrow fringe along a swiftly running stream. Wetlands are dynamic land forms, ever-changing in response to natural and man-made influences.

Inland wetlands are wetlands that are not flooded by tides. Almost 500,000 acres of inland wetlands are present in Massachusetts.

Marsh: Marshes are flooded for most of the growing season. Characteristic plants include cattail, bur-reeds, sedges, blue flag irises.

Wet meadow: The soils of wet meadows are saturated for extended periods during the growing season; but wet meadows do not usually have standing water. Wet meadows contain grasses, sedges, and rushes as well as wildflowers. Wet meadows have been used as pastures through the years.

Shrub swamp: Shrub swamps include a wide variety of wet shrubby thickets ranging from nearly permanently flooded buttonbush swamps to seasonally flooded alder swamps. Shrubs and bushes form a fairly continuous cover and may be difficult to walk through. Trees may be scattered about or in clumps. In the spring, shrub swamps are usually covered with standing water, but as summer progresses, the surface may dry completely.

A **bog** is a type of shrub swamp that forms in depressions under nutrient-poor and acidic conditions. Bogs have saturated peaty soils that are soggy year-round. Low-growing evergreen shrubs with broad leaves are characteristic species. They include leatherleaf, bog rosemary, bog laurel, and sheep laurel. Because of the lack of nutrients, insect-eating plants like pitcher plants and sundews can be found here.

Forested wetlands: Forested wetlands - wooded swamps - can be dominated by trees that shed their leaves each fall or by evergreens. Red maple is typical of the wetter swamps. Forested wetlands are the most common wetland type in Massachusetts.

Freshwater wetlands frequently form "complexes" of two or more of these wetland types. A cattail marsh may be surrounded by a shrub swamp which in turn borders a forested wetland.

Tidal wetlands are those wetlands where water levels periodically change due to the tides. About 100,000 acres of salt and brackish wetlands are found along coastal embayments and along tidally influenced rivers throughout the coastal zone. The presence of salt water severely limits the types of plants that can grow there. Some freshwater wetlands are also tidal, since the incoming tides cause a rising and lowering of both salt and fresh water. Salt/brackish marshes provide home for shellfish as well as spawning grounds for two-thirds of the state's recreational and commercial fish species. Salt marshes are among the most biologically productive habitats in the world. Tidal wetland plant species include smooth cordgrass, salt hay grass, salt grass, black grass, glassworts, high-tide bush, salt marsh bulrush, and seaside goldenrod.

What Is a Healthy Wetland?

Healthy wetlands do not show signs of stress related to degradation or to cumulative effects of smaller impacts.

- Healthy wetlands have a diverse and vigorously growing native plant community with no "invasive" plants (plants that displace healthy wetland vegetation).
- Healthy wetlands are not degraded by pollution discharges, fill, or trash.
- Healthy wetlands have not had alterations to the natural water flow into, through, or out of the wetland. Such alterations can include channelization, ditching, berms, dikes, dams, culverts, and tidegates.

What Degrades a Wetland?

Changes in wetlands may result from a number of causes. They may be part of work allowed in a wetland permit granted by the local conservation commission under the state's Wetlands Protection Act. Impacts to wetlands occur when people violate the wetlands law by accident or on purpose. Some impacts are allowed as exemptions to the law, such as growing or harvesting certain crops. Polluted runoff may flow into a wetland as nonpoint source pollution and alter its chemistry and hydrology.

Impacts to Vegetation

Changes in vegetation usually are a symptom of disturbance of a wetland. Such changes may be subtle or very obvious such as in the invasion of common reed; but they are always accompanied by changes in use by wildlife and fish species.

Lythrum salicaria L.
Purple Loosestrife or Spiked Loosestrife

1) **Exotic species:** Some plant species can replace the plant species that normally grow in wetlands, especially when the wetland has been stressed by pollution, filling, or other disturbance. These invasive plants usually cannot support existing wildlife and fish populations. Examples of invasive plant species include common reed *(Phragmites australis)* or purple loosestrife *(Lythrium salicaria)*.

2) **Removal of vegetation:** Some wetlands have been mowed or logged. Loss of wetland vegetation damages habitat necessary for wildlife and fish.

3) **Streambank disturbance:** Removing vegetation from a streambank wetland decreases bank stability and may increase erosion of soils and degrade water quality.

Phragmites communis Trin.
Reed

Changes in Wetland Elevations and Hydrology

The relationship between the level of the land surface and the water creates and maintains wetlands. Changes in elevation, such as filling and excavation, cause changes in wetland hydrology. Wetlands play a role in providing healthy flows for rivers. By storing excess water in times of high flow, wetlands moderate flooding. Floodwater held by wetlands is released slowly, supplementing flow in times of low flow or drought.

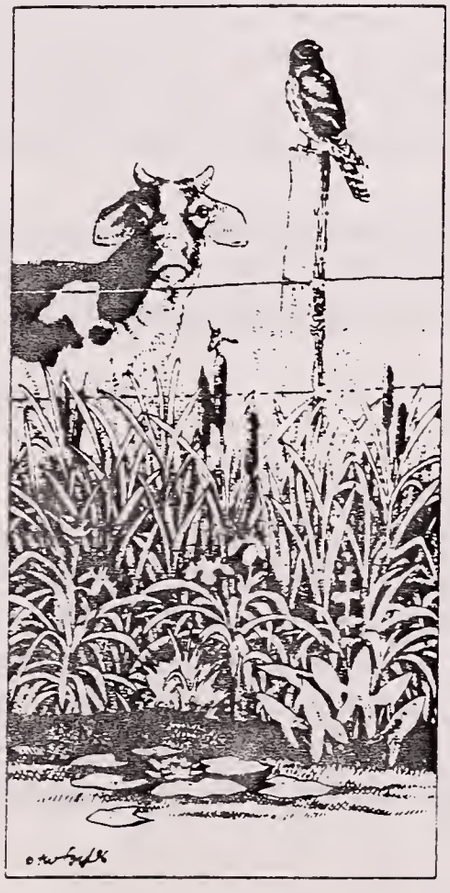
1) **Fill:** Whether clean or contaminated, fill has a damaging effect on wetlands. Fill smothers vegetation and changes elevation of the wetland surface and water levels in the wetland. Many wetlands have been filled to the point that they are too dry to function as wetlands. Polluted fill obviously degrades the wetland even further.

2) **Flooding:** Dead or dying trees in standing water are a sign that the water levels have changed beyond seasonal changes. Flooding may signal natural processes such as beavers building dams, or human activities such as highway construction.

3) **Ditching:** Drainage ditches have been constructed in many wetlands to lower water levels. Historically, this was done to make wetlands suitable for growing crops or to prepare wetlands for development. In other cases, ditches were dug for mosquito control - to drain pools of standing water where mosquitos breed. Material excavated from the ditches was deposited on the stream bank and in the adjacent wetlands creating berms that prevent water from reaching the wetland.

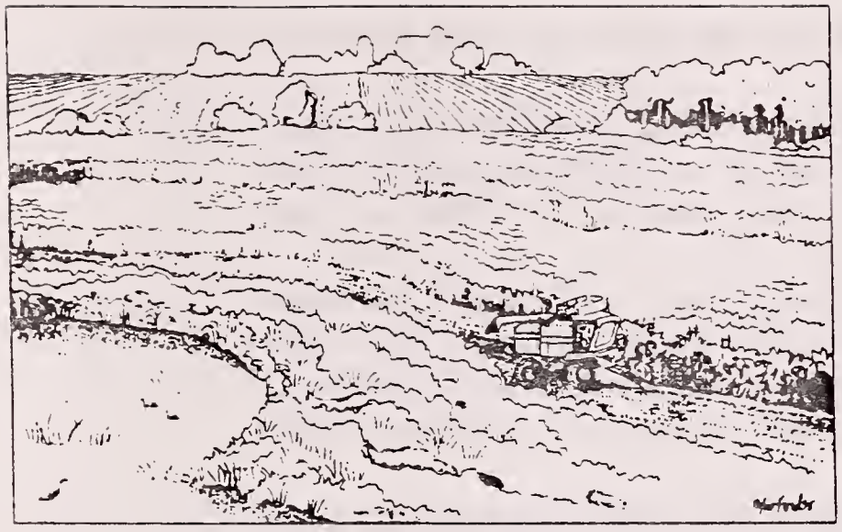
4) **Excavation:** Excavation of wetlands involves removing wetland soils and the material underlying the wetland. This may be done to construct a wildlife or farm pond or to mine sand and gravel. Excavation changes the character of the area from a marsh or swamp to open water. This causes a change in fish and wildlife use and other functions. Mining sand and gravel deposits may expose underlying aquifers to polluted surface waters.

Water Quality Degradation



One of the important functions of wetlands is their ability to improve water quality by removing pollutants such as heavy metals and nutrients. Pollutants may adhere to soil particles or be taken up into the roots of wetland plants. Significant improvement of water quality may be measured for water that has passed through wetlands. However, discharge of pollutants directly into the wetlands may overburden their natural cleansing ability.

1) **Runoff:** Stormwater running off the land surface may bear road salt, sediments, pesticides, and fertilizers that will degrade wetlands as well as downstream rivers and estuaries. This may lead to changes in the wetland plant community and subsequent wildlife use. *Phragmites* often invades such sites.



3) **Erosion and sedimentation:** Erosion is the process by which soils are washed into wetlands and water bodies. Erosion leaves wetlands and streams clogged with sediment. This excess material changes the elevations of the wetland bringing changes in habitat for plants and animals and changes in hydrology. Sedimentation causes 70% of water pollution problems because of bacteria and other contaminants that are carried on sediment particles.

What Can Be Done to Help Our Wetlands?

Wetlands Protection

The Massachusetts Wetlands Protection Act is the primary way in which existing wetlands are protected. The Act requires those who wish to do work such as building or clearing in or near wetlands to get a permit from the local conservation commission. For information about the Act and how it applies to a particular wetland, call your local conservation commission.

Wetlands may be permanently protected from development if they are bought by the town and put in the protective care of the conservation commission, or if some other organization such as a land trust purchases the wetland to protect it.

Wetlands Restoration

Wetlands that are degraded, and some wetlands that have been completely destroyed, may be restored. To restore a wetland, it is necessary to address the cause of degradation or destruction. It's easy to confuse the symptoms of degradation, such as the presence of common reed, with the cause. Fill that has been placed in a wetland will probably be obvious. It may be more difficult to identify pipes that are discharging road runoff into a wetland as the cause of degradation. The first step is to walk the wetland and identify all possible causes of the problem. Get a history of the area by talking to neighbors, looking at old photographs (including aerial photos), and looking at adjacent land uses.

Activities that restore wetlands include:

1) **Removing Fill:** Removing fill from a wetland allows the water flow to return.

2) **Replanting:** Replanting is usually conducted in conjunction with other restoration work such as fill removal. If the hydrology or elevations are not correct, replanting alone will not restore a wetland.

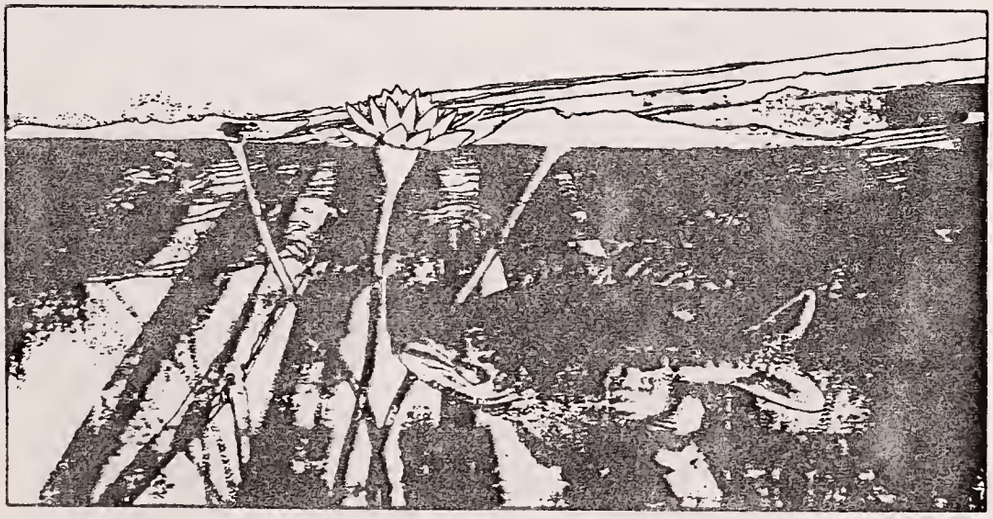
3) **Restoring Water Flow:** In tidal areas, many salt marshes have been degraded when tidal flow is interrupted by a narrow bridge, pipe that is too small, or tide gate that does not allow water to enter the marsh. Removing these restrictions allows normal tidal flooding to occur.

4) **Replacing Wetland Soils:** If soils have been eroded or otherwise removed from the wetland, they will need to be replaced with organic soils that can support wetland plants.

5) **Removing a Source of Pollution:** If the wetland is being degraded by stormwater from adjacent roadways or by runoff from a farm field, the remedy is to remove the polluting source. This can be done by diverting runoff away from the wetland.

6) **Stabilizing Banks:** River or lake banks may have lost their vegetation due to erosion or from the movement of cattle. New "bioengineering" techniques use native plant materials to stabilize soils until new plants can take hold.

Often more than one of these techniques is used for any restoration project. Refer to "WRBP Wetland Restoration Activities in Your Area" and request a fact sheet for any of the listed projects.



Who Will Restore Our Wetlands?

Everyone can help. Restoring Massachusetts' wetlands will require the efforts of many people including government agencies, private organizations, businesses, civic groups, educators, scientists, wetland owners, and other private citizens. The Massachusetts Wetlands Restoration & Banking Program (WRBP) was established in the Executive Office of Environmental Affairs in 1993 to initiate, facilitate, coordinate, and implement this effort. Under its "GROWetlands" initiative (Groups Restoring Our Wetlands), WRBP works with project sponsors to restore degraded and destroyed wetlands. Any individual or group can sponsor a wetland restoration project. WRBP can help evaluate the condition of the wetland and determine whether the wetland is a candidate for restoration. If it is, WRBP can help you get started. Getting the cooperation of the landowner is an important first step!

GROWetlands sponsors receive technical assistance and help securing project funding and, in return, they agree to use the project to provide public education and essential data about the project. WRBP coordinates the Partnership To Restore Massachusetts Wetlands, an alliance of government and private groups, businesses, and individuals who work together to support GROWetlands projects. Many of these groups have funding programs for restoration projects.

For more information contact:

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